

REMARKS

Claims 1, 3, 5-9, 11, and 13-28 are pending. Claims 1, 3, 5-7, 9, 11 and 13-15 are amended, claims 17-28 are added to the application via the present submission, and claims 2, 4, 10 and 12 are canceled.

Claim Rejections Under 35 U.S.C. § 102

Claims 3-7 were rejected under 35 U.S.C. § 102(b) as being anticipated by *Hatakeyama et al.* (US Patent 5,883,470; “*Hatakeyama*”). Favorable reconsideration is requested in view of the amendments and remarks made herein.

Amended claim 3 describes a beam source. The beam source comprises a plasma generating chamber, a gas inlet port, a plasma generator, a plurality of grid electrodes having beam extraction holes, a first power supply for applying a voltage between the plurality of grid electrodes. In addition, amended claim 3 comprises a coil disposed near the plasma generating chamber, and a second power supply for intermittently supplying a high frequency current to the coil.

Applicants respectfully submit that *Hatakeyama* does not teach or suggest the subject matter presented above as specifically recited in amended claim 3. *Hatakeyama* discloses an FAB source having an excitation coil disposed outside of a discharge tube and an inductively coupled plasma generator for generating a high density plasma in the discharge tube. With regard to the inductively coupled plasma generator, *Hatakeyama* merely states:

Also, in the central region of the tube, an excitation coil 25 of one to three turns is provided for generating a high density plasma by applying an excitation magnetic field from an inductively coupled plasma generator 24 at 13.56 MHz.

(*Hatakeyama*, col. 4, lines 19-23). However, *Hatakeyama* fails to teach or suggest that the inductively coupled plasma generator intermittently supplies a high-frequency voltage to the excitation coil.

In the present invention, a second power supply intermittently supplies a high-frequency voltage to the coil. The intermittent power supply generates positive-negative ion plasma containing positive ions and negative ions and thereby increasing sheath length. A high-density ion beam is formed when the diameter of the beam extraction holes is approximately equal to the sheath length. Since the sheath length is increased in the present invention and made to be approximately equal to the diameter of the beam extraction holes, a high-density ion beam can be formed. (Specification, page 11, paragraph 0038). *Hatakeyama* does not disclose the intermittent power supply for generating positive-negative ion plasma, and therefore, does not teach or suggest the subject matter as specifically recited in amended claim 3.

Amended claim 5 discloses a plasma potential adjustment electrode disposed in the plasma generating chamber and a plasma potential adjustment power supply. The plasma potential adjustment electrode is in addition to the plurality of grid electrodes as required by the claims.

Hatakeyama only discloses an upstream grid electrode and a downstream grid electrode. *Hatakeyama* does not disclose a plasma potential adjustment electrode in addition to the upstream grid electrode and the downstream grid electrode. The Examiner improperly describes element 29 in Fig. 2 of *Hatakeyama* as a grid electrode and a plasma potential adjustment

electrode. Therefore, *Hatakeyama* does not teach or suggest the subject matter as specifically recited in amended claim 5.

Claim Rejections Under 35 U.S.C. § 103

Claims 1 and 2 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Hatakeyama*; Claims 9-16 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Hatakeyama* in view of *Ono et al.* (US Patent 4,450,031; “*Ono*”). Favorable reconsideration is requested in view of the amendments and remarks made herein.

Amended claims 1, 9 and 11 disclose a coil disposed near the plasma generating chamber, and a second power supply for intermittently supplying a high frequency current to the coil. As stated in the remarks pertaining to the patentability of claim 3, *Hatakeyama* does not disclose the intermittent power supply for generating positive-negative ion plasma, and therefore, does not teach or suggest the subject matter as specifically recited in amended claim 1.

Ono is relied upon as disclosing a holder disposed in a vacuum chamber. *Ono* discloses an ion shower apparatus including a specimen chamber with a substrate table therein, the substrate table holding an object to be worked on by the ion beam. However, *Ono* fails to make up for the shortcomings of *Hatakeyama* as described above. Therefore, *Hatakeyama* in view of *Ono* does not teach or suggest the subject matter as specifically recited in amended claims 9, 11 and 13-16.

Furthermore, amended claim 13 discloses a plasma potential adjustment electrode disposed in the plasma generating chamber and a plasma potential adjustment power supply.

The plasma potential adjustment electrode is in addition to the plurality of grid electrodes as required by the claims.

As stated in the remarks pertaining to the patentability of claim 5, *Hatakeyama* only discloses an upstream grid electrode and a downstream grid electrode. *Hatakeyama* does not disclose an additional plasma potential adjustment electrode. *Ono* also does not disclose an additional plasma potential adjustment electrode. Therefore, *Hatakeyama* in view of *Ono* does not teach or suggest the subject matter as specifically recited in amended claim 13.

Accordingly, withdrawal of the § 102 anticipation rejection of claims 1, 3 and 5-8 and the § 103 obviousness rejection of claims 1, 9, 11, 13-16 is hereby solicited.

New Claims

New claims 17-20, 24 and 28 add features to the second power supply. The claim recites that the second power supply is configured to interrupt application of the high-frequency voltage for a period of time that is sufficiently longer than a period of time in which electrodes in the positive-negative ion plasma are attached to the gas to generate the negative ions and sufficiently shorter than a period of time in which an electron density in the positive-negative ion plasma is lowered to extinguish the positive-negative ion plasma and to apply the high-frequency voltage for a period of time that is long enough to recover an energy of the electrons in the positive-negative ion plasma which has been lowered during the interruption of the high-frequency voltage. (Specification, page 15, paragraph 0060).

New independent claims 21 and 25 correspond to original claims 5 and 13 respectively.

New dependent claims 22, 23, 26 and 27 recite features that are disclosed in original dependent claims.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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